CLAIMS

1. A metal gasket for a cylinder head comprising:

two base plates (2) respectively made of metal plates and layered over each other, each of said base plates (2) including cylinder holes (2a) formed so as to correspond to respective cylinder bores on a cylinder block of an internal combustion engine, annular beads (2b) of an angled cross-sectional shape formed around said respective cylinder holes, coolant holes (2c) formed on outer peripheral portions of said respective annular beads so as to correspond to coolant jackets on said cylinder block and to coolant holes on a cylinder head of said internal combustion engine, and an outer peripheral bead (2d) having a cross-sectional shape sloping on one side and being formed in a position so as to totally surround said annular beads and said coolant holes;

an auxiliary plate (3) made of a metal plate and interposed between said two base plates; and

a hard metal-plated layer (5) formed on at least one surface of said auxiliary plate and configured to extend from a position more radially inward than said annular bead to a position radially outward so as to overlap each of said annular beads of said base plate and to face a top portion of said annular bead, and thereby to surround each of said cylinder holes on said base plate annularly.

2. The metal gasket for a cylinder head according to claim 1,

wherein an annular bead having an angled cross-sectional shape is formed on said auxiliary plate so as to overlap said annular bead on said base plate and to allow top positions to face each other.

3. A metal gasket for a cylinder head comprising:

two base plates (2) respectively made of metal plates and layered over each other, each of said base plates (2) including cylinder holes (2a) formed so as to correspond to respective cylinder bores on a cylinder block of an internal combustion engine, annular beads (2b) of an angled cross-sectional shape formed around said respective cylinder holes, coolant holes (2c) formed on outer peripheral portions of said respective annular beads so as to correspond to coolant jackets on said

cylinder block and to coolant holes on a cylinder head of said internal combustion engine, and an outer peripheral bead (2d) having a cross-sectional shape sloping on one side and being formed in a position so as to totally surround said annular beads and said coolant holes; and

a hard metal-plated layer (5) formed on either one or both of said two base plates on a surface facing the other base plate and configured to extend from a position more radially inward than said annular bead to a position radially outward so as to overlap each of said annular beads of said base plate and to face a top portion of said annular bead, and thereby to surround each of said cylinder holes on said base plate annularly.

4. The metal gasket for a cylinder head according to any of claims 1 to 3,

wherein said hard metal-plated layer (5) is made of any of nickel, nickel-phosphorus, and copper, and has hardness equal to or above Hv 60.

5. The metal gasket for a cylinder head according to any of claims 1 to 3,

wherein distribution of an amount of a step of said hard metal-plated layer relevant to said plurality of cylinder holes (2a) corresponds to distribution of rigidity of said internal combustion engine relevant to said plurality of cylinder bores.

6. A metal gasket for a cylinder head comprising:

two base plates (2) respectively made of metal plates and layered over each other, each of said base plates (2) including cylinder holes (2a) formed so as to correspond to respective cylinder bores on a cylinder block of an internal combustion engine, annular beads (2b) of an angled cross-sectional shape formed around said respective cylinder holes, coolant holes (2c) formed on outer peripheral portions of said respective annular beads so as to correspond to coolant jackets on said cylinder block and to coolant holes on a cylinder head of said internal combustion engine, and an outer peripheral bead (2d) having a cross-sectional shape sloping on one side and being formed in a position so

as to totally surround said annular beads and said coolant holes;

an auxiliary plate (3) made of a metal plate and interposed between said two base plates;

a metal foil layer (5) made of a metal foil (6) to be attached onto at least one surface of said auxiliary plate and configured to extend from a position more radially inward than said annular bead to a position radially outward so as to overlap each of said annular beads of said base plate and to face a top portion of said annular bead and thereby to surround each of said cylinder holes on said base plate annularly; and

an adhesive layer (7) made of an adhesive to attach said metal foil to said auxiliary plate while at least being pressurized.

7. The metal gasket for a cylinder head according to claim 6,

wherein an annular bead having an angled cross-sectional shape is formed on said auxiliary plate so as to overlap said annular bead on said base plate and to allow top positions to face each other.

8. A metal gasket for a cylinder head comprising:

two base plates (2) respectively made of metal plates and layered over each other, each of said base plates (2) including cylinder holes (2a) formed so as to correspond to respective cylinder bores on a cylinder block of an internal combustion engine, annular beads (2b) of an angled cross-sectional shape formed around said respective cylinder holes, coolant holes (2c) formed on outer peripheral portions of said respective annular beads so as to correspond to coolant jackets on said cylinder block and to coolant holes on a cylinder head of said internal combustion engine, and an outer peripheral bead (2d) having a cross-sectional shape sloping on one side and being formed in a position so as to totally surround said annular beads and said coolant holes;

a metal foil layer (5) made of a metal foil (6) to be attached onto any of one and both of said two base plates on a surface facing the other base plate, and configured to extend from a position more radially inward than said annular bead to a position radially outward so as to overlap each of said annular beads of said base plate and to

face a top portion of said annular bead, and thereby to surround each of said cylinder holes on said base plate annularly; and

an adhesive layer (7) made of an adhesive to attach said metal foil to said auxiliary plate while at least being pressurized.

9. The metal gasket for a cylinder head according to any of claims 6 to 8,

wherein said metal foil (6) is made of any of aluminum, an aluminum alloy, steel, stainless steel, bronze, titanium, and nickel, and has hardness equal to or above Hv 60.

10. The metal gasket for a cylinder head according to any of claims 6 to 9,

wherein said adhesive for said adhesive layer (7) is made of any of phenol, epoxy, and polyimide, or a combination of at least two types of these materials.

11. A metal gasket for a cylinder head comprising:

two base plates (2) respectively made of metal plates and layered over each other, each of said base plates (2) including cylinder holes (2a) formed so as to correspond to respective cylinder bores on a cylinder block of an internal combustion engine, annular beads (2b) of an angled cross-sectional shape formed around said respective cylinder holes, coolant holes (2c) formed on outer peripheral portions of said respective annular beads so as to correspond to coolant jackets on said cylinder block and to coolant holes on a cylinder head of said internal combustion engine, and an outer peripheral bead (2d) having a cross-sectional shape sloping on one side and being formed in a position so as to totally surround said annular beads and said coolant holes; and

soft surface metal-plated layers (7) formed on at least outer surfaces of said two base plates so as to cover at least said respective annular beads.

12. A metal gasket for a cylinder head comprising:

a single base plate (2) made of a metal plate and including cylinder holes (2a) formed so as to correspond to respective cylinder bores on a cylinder block of an internal combustion engine, annular

beads (2b) of an angled cross-sectional shape formed around said respective cylinder holes, coolant holes (2c) formed on outer peripheral portions of said respective annular beads so as to correspond to coolant jackets on said cylinder block and to coolant holes on a cylinder head of said internal combustion engine, and an outer peripheral bead (2d) having a cross-sectional shape sloping on one side and being formed in a position so as to totally surround said annular beads and said coolant holes; and

soft surface metal-plated layers (7) formed on both surfaces of said base plate so as to cover at least said respective annular beads.

13. The metal gasket for a cylinder head according to any of claims 11 and 12,

wherein said soft surface metal-plated layer (7) is formed as any of a single layer and a plurality of layers using any of tin, copper, silver, and alloys thereof, and has surface hardness equal to or below Hv 60.

14. The metal gasket for a cylinder head according to any of claims 11 to 13,

wherein a thickness of said soft surface metal-plated layer (7) is set in a range from 3 μm to 40 μm inclusive.